

rule for the polar bear (72 FR 1064), presents results from state-of-the-art climate models that are substantially improved over models used in the IPCC TAR and ACIA reports (M. Holland, NCAR, in litt. to the Service FWS, 2007; DeWeaver 2007). Results of the AR4 are presented in this section, followed by discussion of several key, peer-reviewed articles that discuss results presented in the AR4 in greater detail or use AR4 simulations to conduct additional, in-depth analyses.

In regard to surface air temperature changes, the IPCC AR4 states that the range of expected globally averaged surface air temperature warming shows limited sensitivity to the choice of SRES emissions scenarios for the early 21st century (between 0.64 and 0.69 degrees C for 2011 to 2030 compared to 1980 to 1999, a range of only 0.05 °C), largely

due to climate change that is already committed (IPCC 2007, p. 749). By the mid-21st century (2046–2065), the choice of SRES scenario becomes more important for globally averaged surface air temperature warming (with increases of 1.3 degree C for the B1 scenario, 1.8 degree C for A1B, and 1.7 degree C for A2). During this time period, about a third of that warming is projected to be due to climate change that is already committed (IPCC 2007, p. 749).

The “limited sensitivity” of the results is because the state-of-the-art climate models used in the AR4 have known physics in connecting increases in GHGs to temperature increases through radiation processes (Overland and Wang 2007a, pp. 1–7, cited in J. Overland, NOAA, in litt. to the Service, 2007), and the GHG levels used in the SRES emissions scenarios are relatively

similar until around 2040–2050 (see Figure 5). Because increases in GHGs have lag effects on climate and projections of GHG emissions can be extrapolated with greater confidence over the next few decades, model results projecting out for the next 40 to 50 years (near-term climate change estimates) have greater credibility than results projected much further into the future (long-term climate change) (J. Overland, NOAA, in litt. to the Service, 2007). Thus, the uncertainty associated with emissions is relatively smaller for the 45-year “foreseeable future” for the polar bear listing. After 2050, uncertainty associated with various climate mechanisms and policy/societal changes begins to increase, as reflected in the larger confidence intervals around the trend lines in Figure 5 beyond 2050.

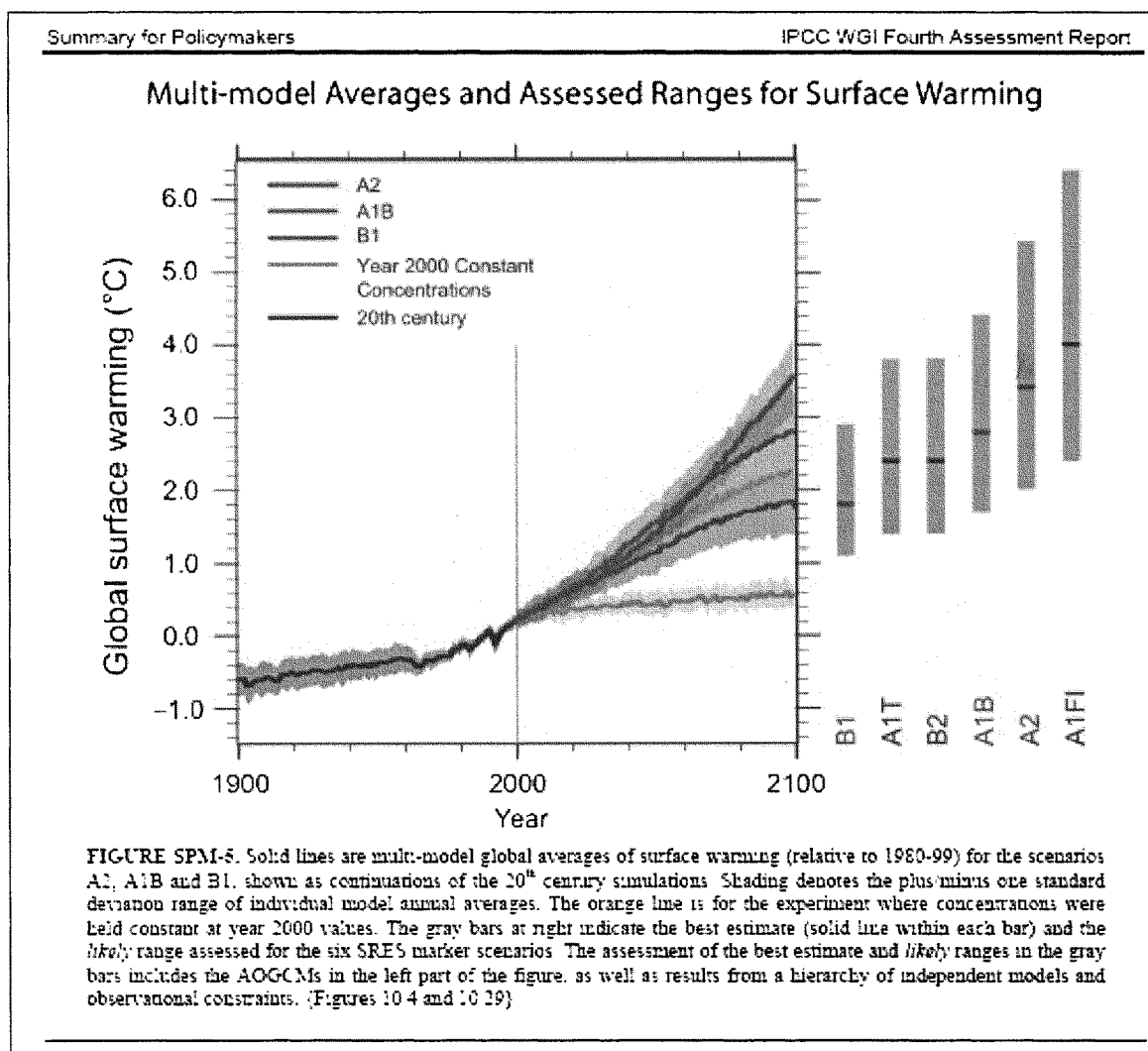


Figure 5. Average projected global surface warming for SRES emissions scenarios in a multiple model ensemble (from IPCC 2007, p. 14).